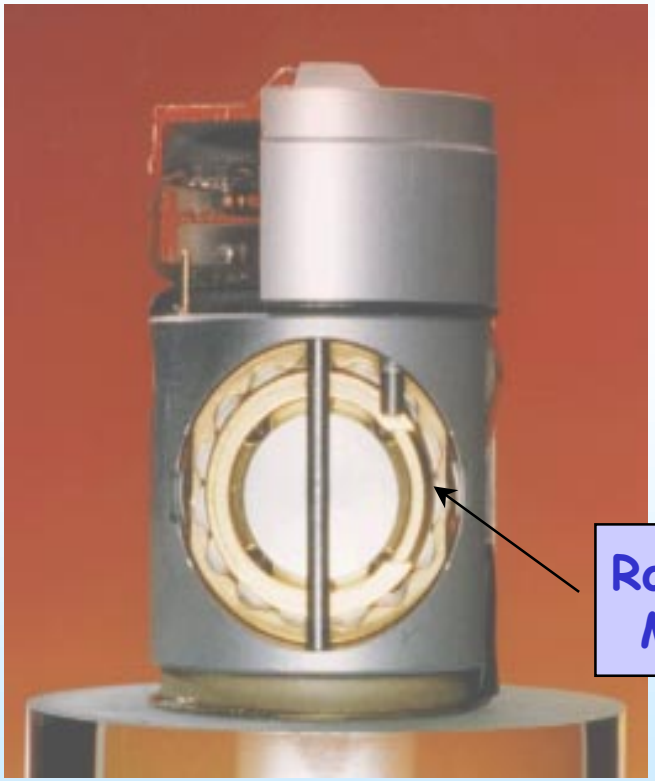
43rd Annual Fuze Conference
6-8 April 1999

FUZING FOR SPECIAL ENVIRONMENTS

Jim Sorensen PRIMEX Technologies
Ordnance and Tactical Systems Division
1840 Fairway Drive San Leandro, CA 94577
(510) 346 1887 fax (510) 346 1804
e-mail: jsorensen@san.prmx.com

PRIMEX TECHNOLOGIES

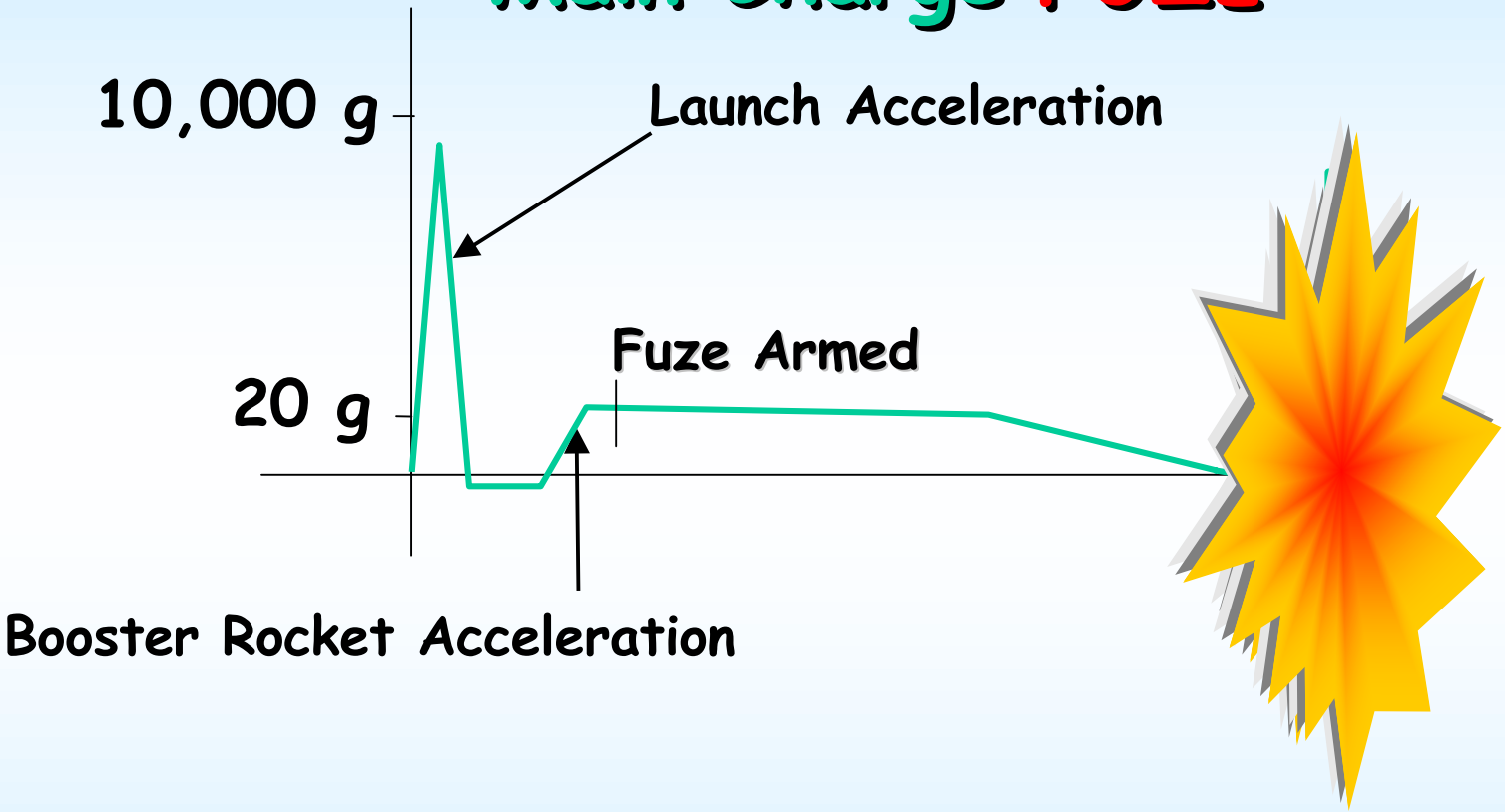
PEPZ Piezo Electro-Mechanical Fuze

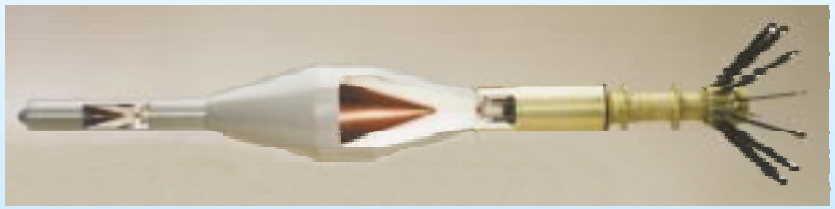


PROX TECHNOLOGIES

ACCELERATION/SHOCK PLOT

Main Charge FUZE





SYSTEM: Panzerfaust

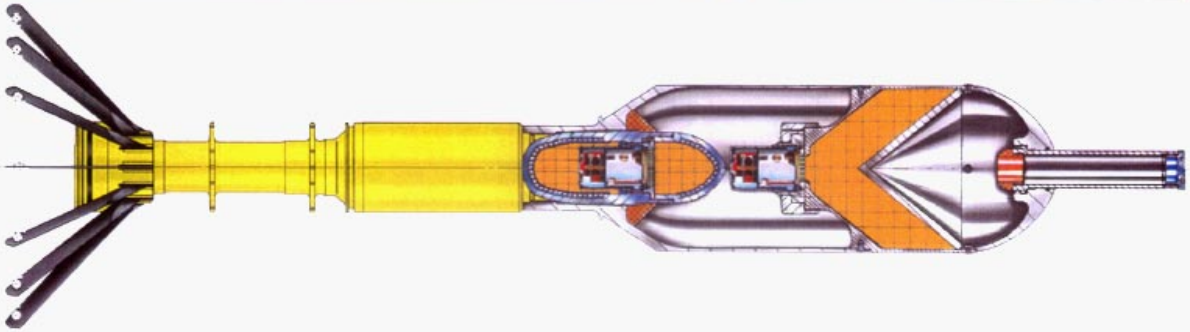
FUZE: Piezo Electro-Mechanical

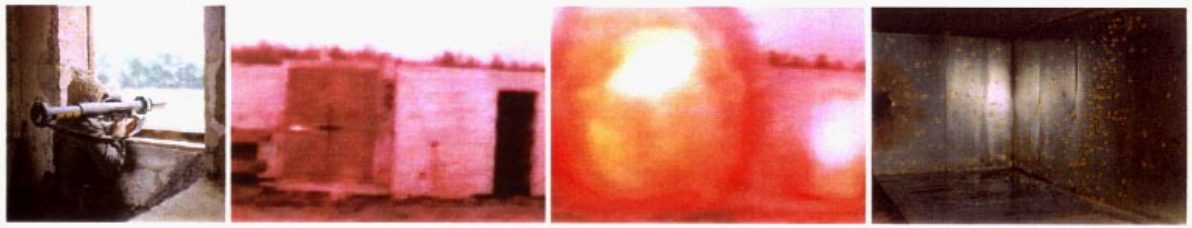
PROX TECHNOLOGIES

ACCELERATION PLOT Artillery or Mortar

PROX TECHNOLOGIES

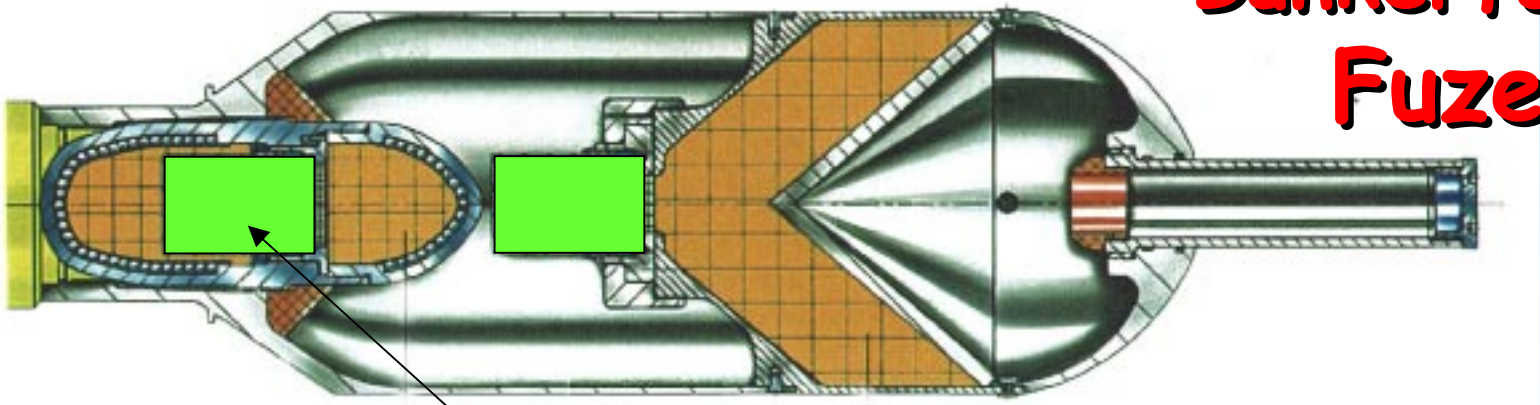
Bunkerfaust Uses Breaching Charge with Follow Through Anti-Personnel Grenade



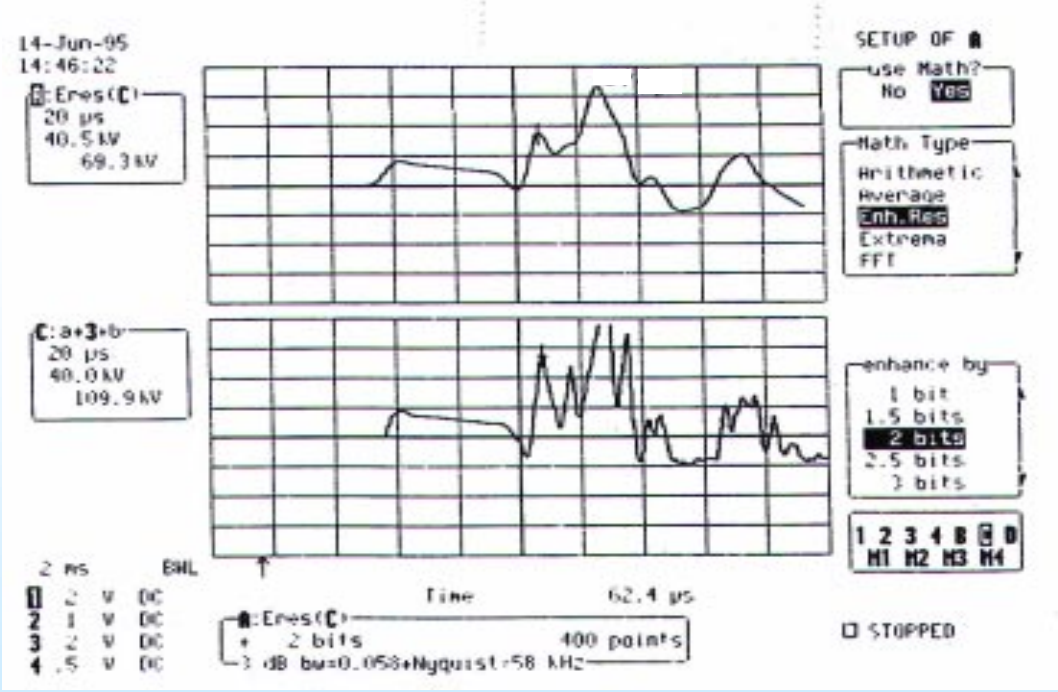


PROX TECHNOLOGIES

Bunkerfaust Fuze



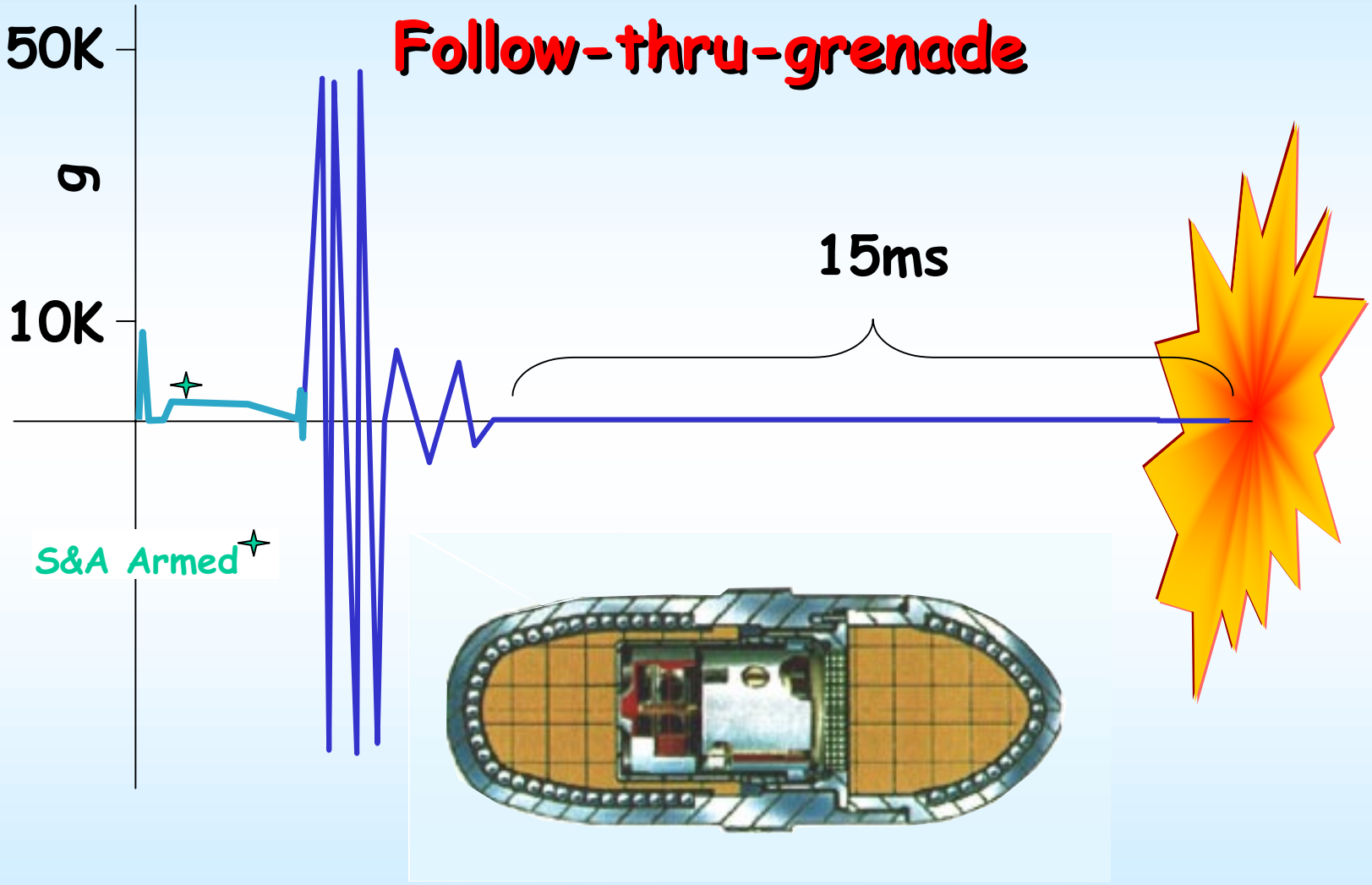
ACCELEROMETER MEASURED ≈ 134,000 g's



PROX TECHNOLOGIES

ACCELERATION/SHOCK PLOT

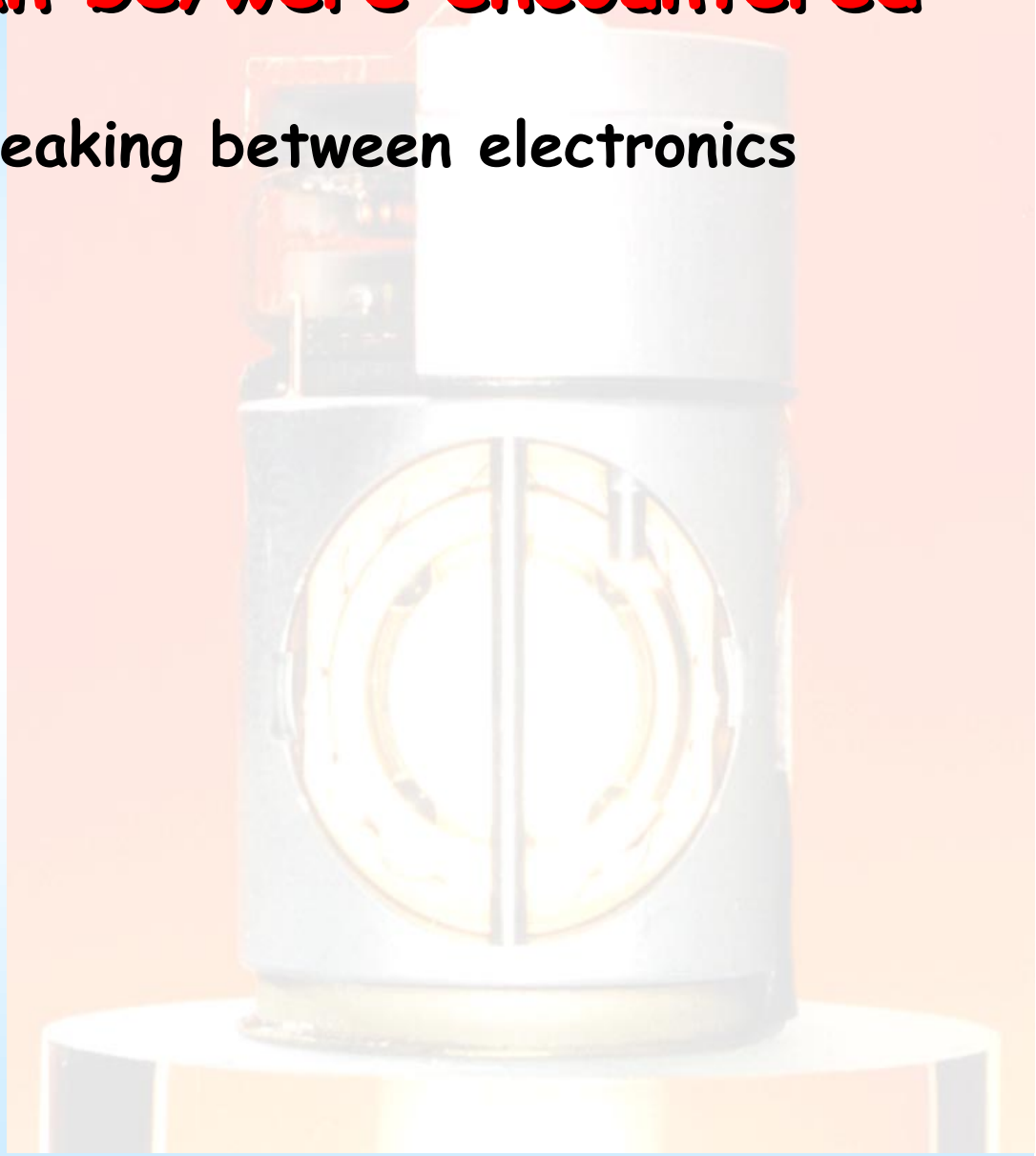
Follow-thru-grenade



PROX TECHNOLOGIES

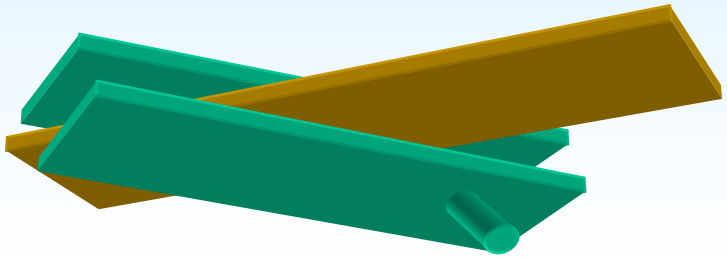
Problems that can be/were encountered

1. Electrical contact breaking between electronics and detonator

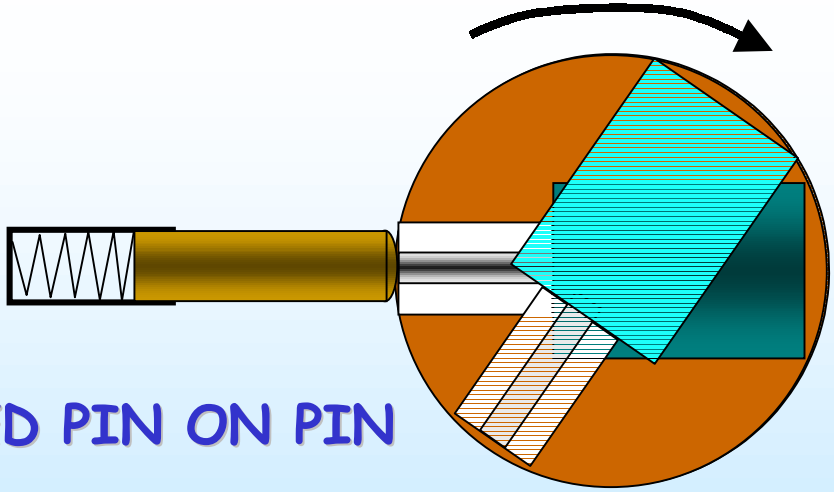


TYPES OF ELECTRICAL CONTACTS

KNIFE BLADE

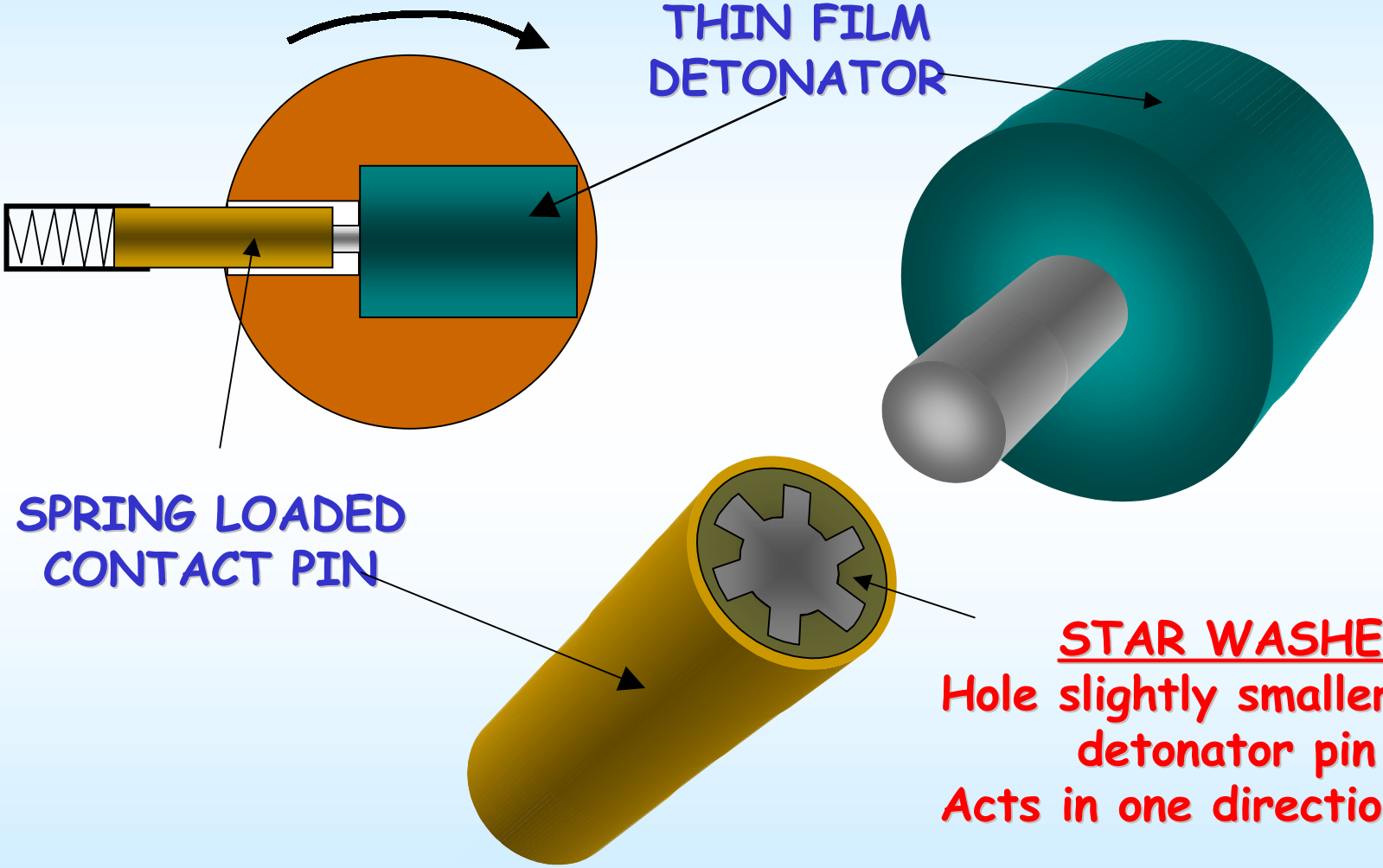


COPPER SPRING



SPRING LOADED PIN ON PIN

ELECTRICAL CONTACT SOLUTION



STAR WASHER

Hole slightly smaller than detonator pin

Acts in one direction only

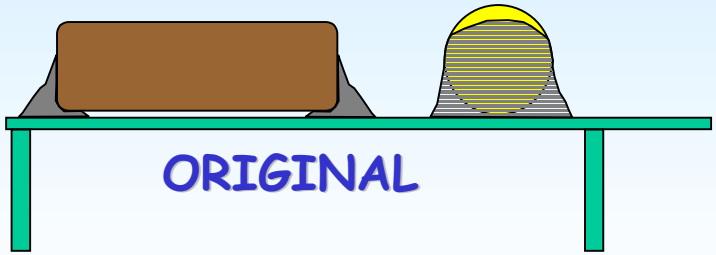
PRIMEX TECHNOLOGIES

Problems that can be/were encountered

1. Electrical contact breaking between electronics and detonator

2. Circuit boards break, SMC solder break/cracks

MODIFIED CIRCUIT BOARDS & MOUNTING PROCEDURES



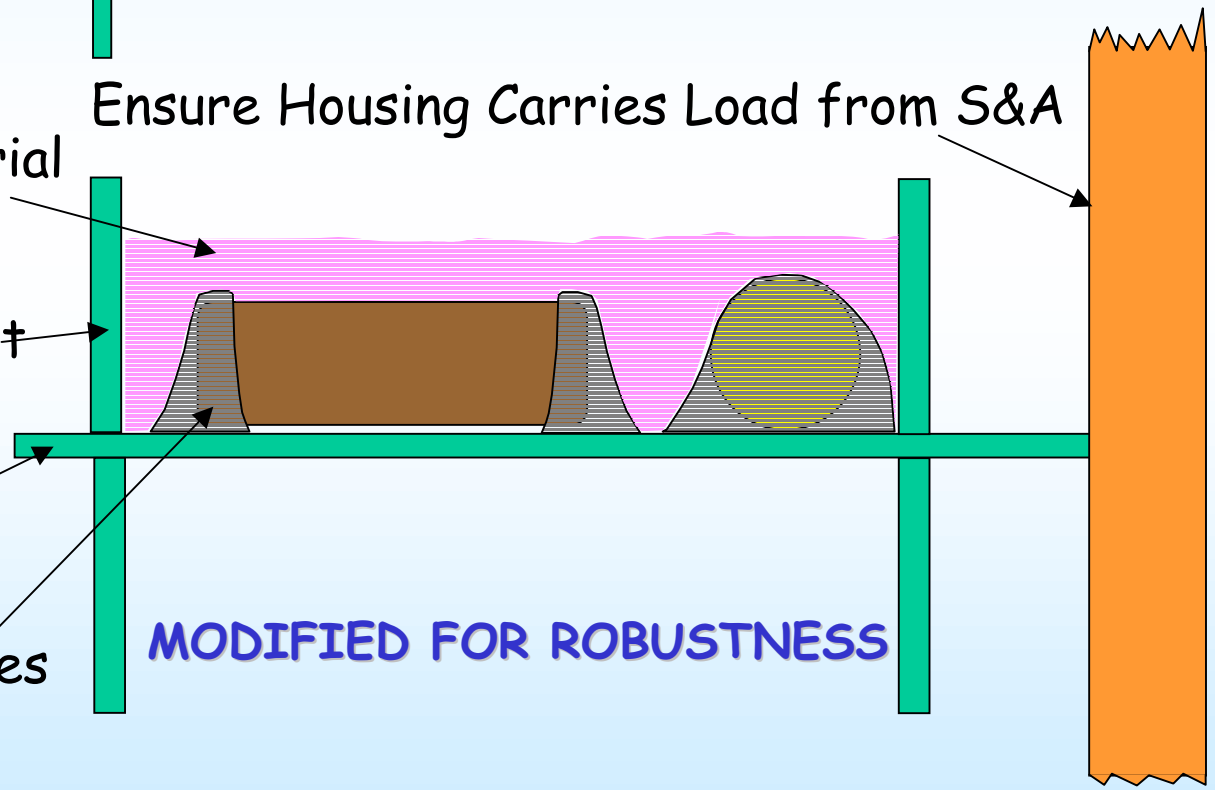
Ensure Housing Carries Load from S&A

Compliant Potting Material
100% Temp Cycled

More Support for Circuit Boards

Thicker Circuit Boards

Special Solder Techniques
(Quantity & Quality)



PROX TECHNOLOGIES

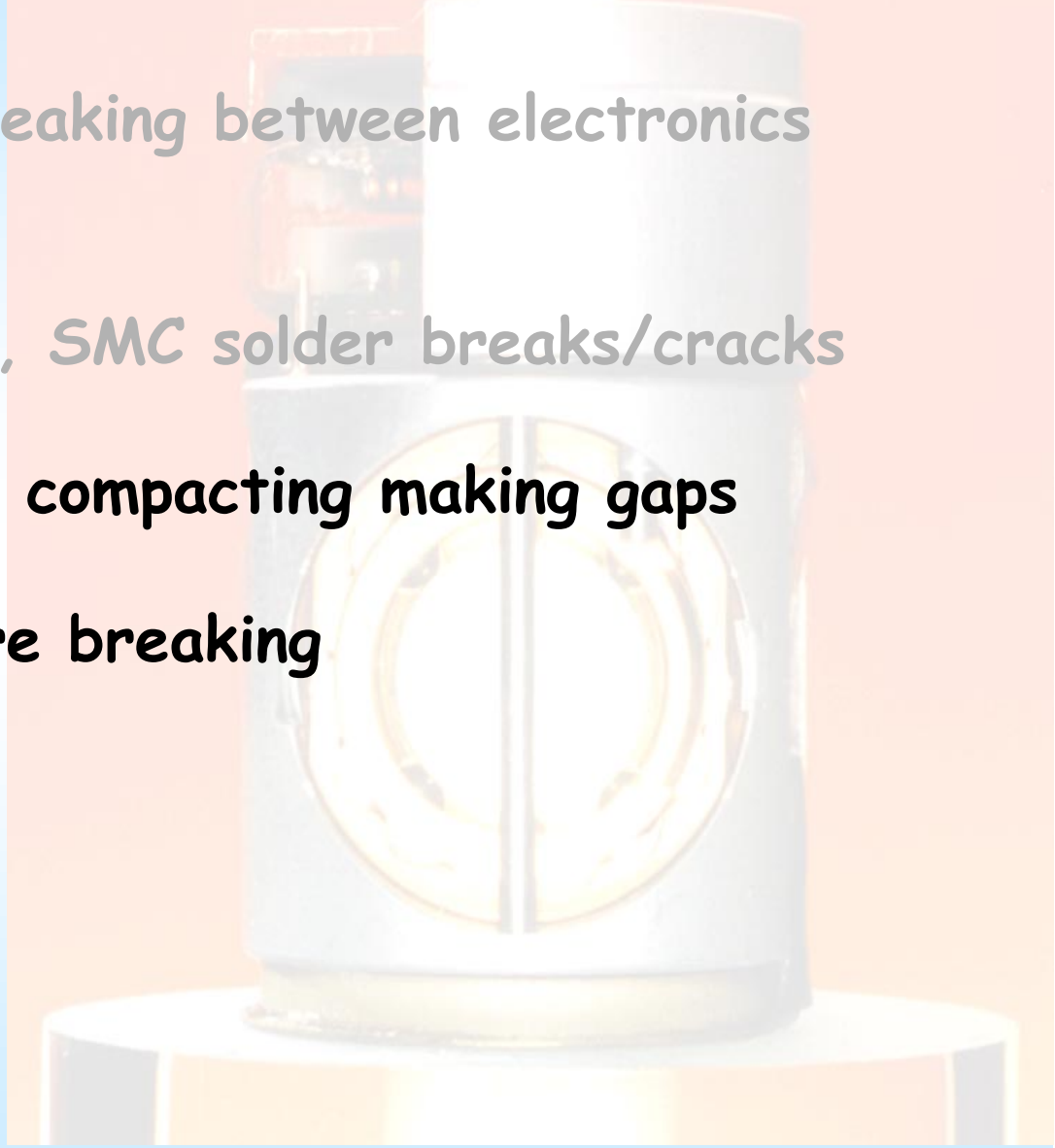
Problems that can be/were encountered

1. Electrical contact breaking between electronics and detonator

2. Circuit boards break, SMC solder breaks/cracks

3. Detonator explosives compacting making gaps

4. Detonator bridge wire breaking

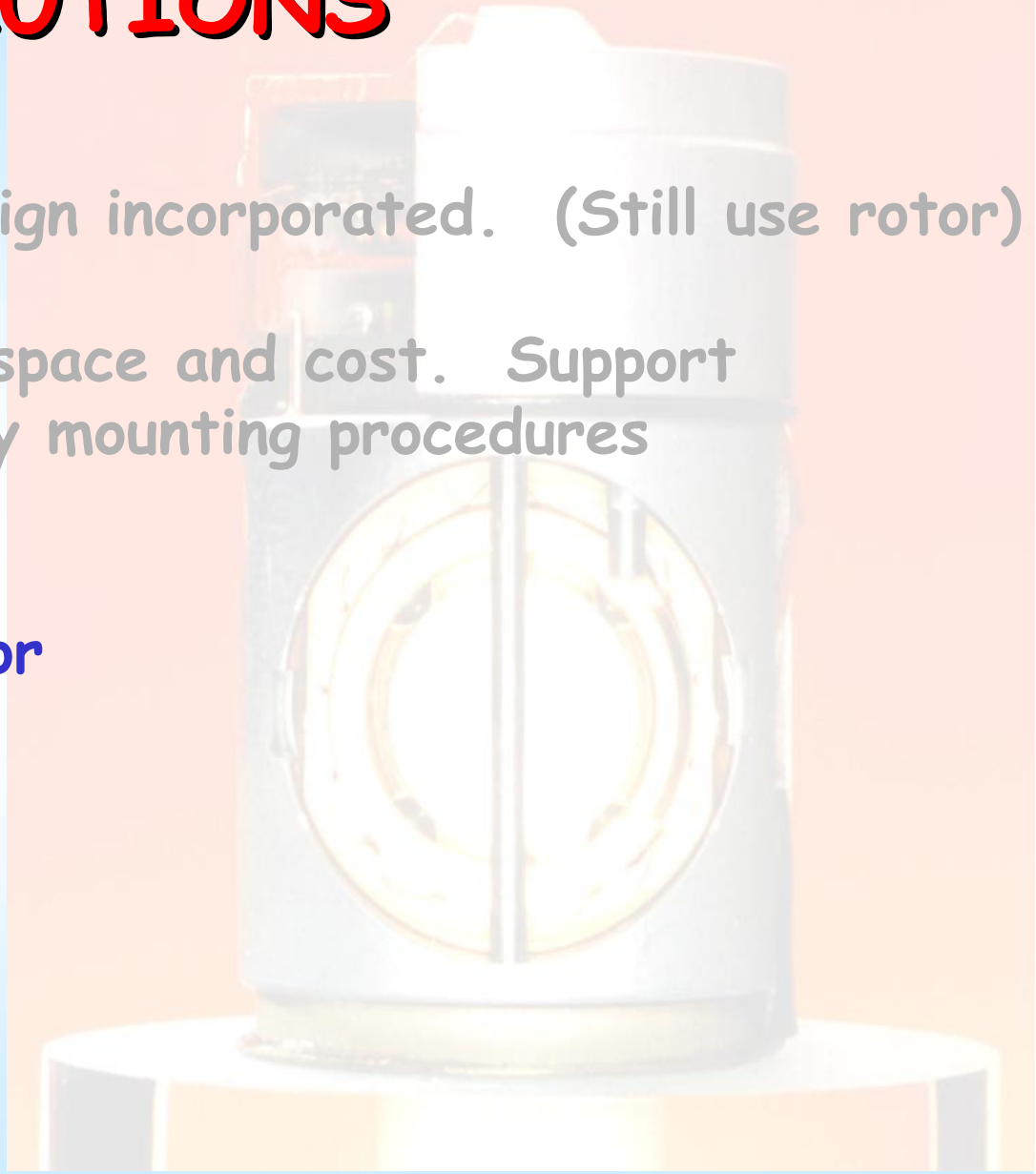


SOLUTIONS

1. Different contact design incorporated. (Still use rotor)

2. Must still use SMD--space and cost. Support circuit boards, modify mounting procedures Pot electronics

3. **Use thin film detonator**



Problems that can be/were encountered

1. Electrical contact breaking between electronics and detonator
2. Circuit boards break, SMC solder breaks/cracks
3. Detonator explosives compacting making gaps
4. Detonator bridge wire breaking
5. Parts failure --Not robust enough
6. Piezo failure --cracking due to overload

SOLUTIONS

Modify Contact Design

Must still use SMD--space and cost. Support circuit boards, modify mounting procedures. Pot electronics

Use thin film detonator

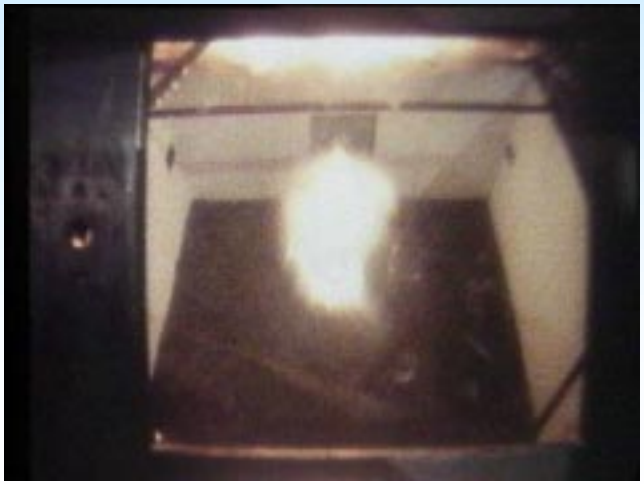
Design for load.

Material specification change. Mass design

Follow-thru Grenade Sequence

1

2



3

4

Total time ~ 15 ms

PROX TECHNOLOGIES

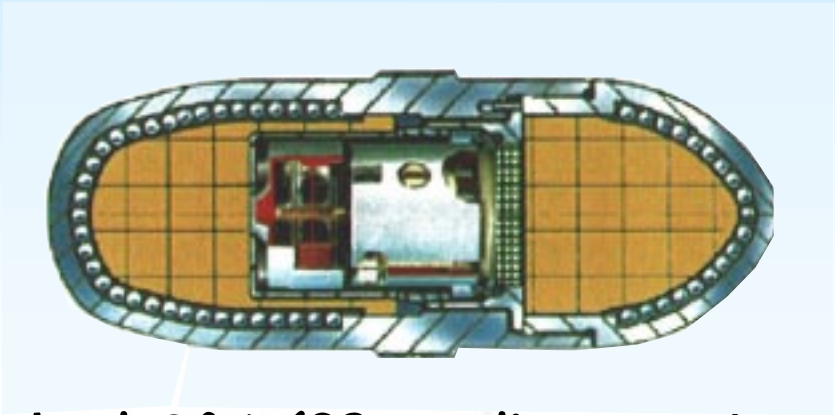
TECHNICAL SPECIFICATIONS

(in production)

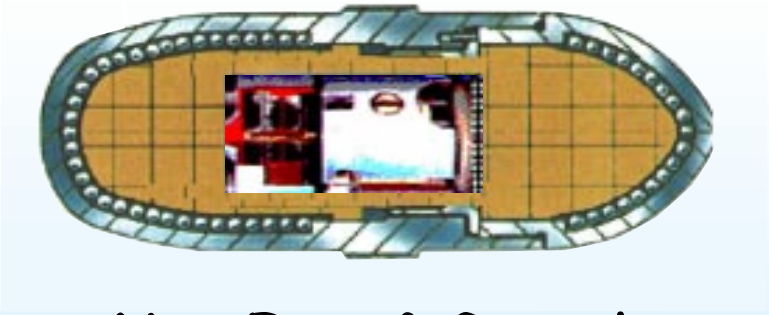
Diameter (in aluminum case)	29 mm
Height (in case)	39.5 mm
Weight (in case)	60 grams
Safe & Arm Mechanism	2 independent safeties
Detonator	Type ZP-81-7 (DM 1461)thin layer (100± 20 Ohms)
Function	All Fire ≥ 90V at 2 nF (on detonator pin) No Fire ≤ 20V at 2 nF (on detonator pin)
Charge	Primary 55 mg Silverazide Secondary 60 mg PETN

PRIMEX TECHNOLOGIES

NEW DEVELOPMENTS



Standard S&A (29mm diameter in aluminum case)



New Fuze & Grenade
(about 20mm dia with slightly smaller grenade)

TECHNICAL SPECIFICATIONS

(in development)

Diameter (in aluminum case)	18mm
Height (in case)	39.5mm
Weight (in case)	40 grams
Safe & Arm Mechanism	2 independent safeties
Detonator	Type ZP-78-5 thin layer (100 ± 20 Ohms)
Function	All Fire ≥ 90V at 2 nF (on detonator pin) No Fire ≤ 20V at 2 nF (on detonator pin)
Charge	Primary 15 mg Silverazide Secondary 20 mg PETN

PROX TECHNOLOGIES

43rd Annual Fuze Conference

6-8 April 1999

FUZING FOR SPECIAL ENVIRONMENTS

by

Mr. Ruedi Zaugg	Zaugg Electronik, Switzerland
Mr. Markus Joost	EMS Patvag, Switzerland
Mr. Jim Sorensen*	PRIMEX Technologies, USA

ZAUGG ELEKTRONIK AG

EMS

EMS-PATVAG AG

PRIMEX TECHNOLOGIES